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Notes:

1. Untranslatable words are replaced with asterisks (***).
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CLAIM + DETAILED DESCRIPTION

[Claim(s)]

[Claim 1] (A) The epoxy resin which contains the crystalline epoxy which the melting point is 50-130 degrees C, and has two or more epoxy groups in one molecule 70weight % or more in the total epoxy resin, The fusion viscosity in 150 degree C (B) The phenol resin hardening agent of 5 or less POIZU, (C) A hardening accelerator, the fusion silica powder contained 76 to 94weight % in the (D) total resin constituent, (E) Face [carrying out heating kneading] the epoxy resin constituent which uses the Silang coupling agent as an essential ingredient. The inside of the system of this said direction biaxial kneading extrusion machine is maintained under the decompression condition of 250 or less mmHg, using the said direction biaxial kneading extrusion machine as kneading equipment. Furthermore, the manufacture method of the semiconductor epoxy resin constituent characterized by for the temperature of the epoxy resin constituent breathed out from this said direction biaxial kneading extrusion machine after kneading being the temperature more than the melting point of the crystalline epoxy resin of the (A) ingredient in an epoxy resin constituent, and being 90-140 degrees C.

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the manufacture method of the epoxy resin constituent for semiconductor closure excellent in fabrication nature, solder heat resistance, and humidity-tolerant reliability.

[0002]

[Description of the Prior Art] The method of depending on transfer molding of an epoxy resin as the closure method of semiconductor devices, such as IC and LSI, was adopted as a method suitable for low cost and mass production, and improvement has been achieved by improvement of phenol resin which is an epoxy resin and a hardening agent also in respect of reliability. However, in the market trend of the miniaturization of an electric device in recent years, a weight saving, and highly-efficient-izing, while high integration of a semiconductor also progresses every year and surface mounting-ization of a semiconductor package is promoted, a demand in the charge of an IC package is becoming still severer. For this reason, the unsolvable problem has also come out at the charge of a sealing agent from the former. A package is rapidly exposed to high temperature of 200 degrees C or more by adoption of

surface mounting of a semiconductor package at solder immersion or a reflow process, for this reason that greatest problem is boiled. It is that a package breaks, or a chip or interface exfoliation with a lead frame and closure resin arises, and moisture resistance falls, i.e., solder heat resistance. Aim at the improvement in this solder heat resistance. About the charge of an epoxy resin sealing agent, use of heat-resistant epoxy, the stress reduction and the lead frame at the time of solder immersion, Much proposals, such as improvement of the processing conditions of use of flexible resin for adhesive improvement with a chip, addition of an adhesive grant ingredient, increase in quantity of the loadings of a minerals filler, or the Silang coupling agent to silica, have been made.

[0003] It is epoxy and a hardening agent ingredient it to be thought for that it is among these present the most effective, and to be adopted widely, It is the resin constituent which used the phenol resin which uses resin with low fusion viscosity in molding temperature, and has a flexible frame as a hardening agent, and raised the content of the fusion silica in a constituent. Since according to this constituent the reduction in moisture absorption and low thermal expansion-ization can be attained upwards since the content of fusion silica is high, and adhesive strength with a base material improves with the hardening agent of flexible structure Solder heat resistance is good, and the fusion resin constituent at the time of fabrication maintains hypoviscosity by use of resin of low fusion viscosity further, and since mobility is high, the restoration nature into a metallic mold is good. It is beginning (for example, JP,5-175364,A, JP,5-343570,A, JP,6-80763,A each number gazette, etc.) to be widely used in the crystalline epoxy resin to which it is a solid in normal temperature and the viscosity at the time of fusion falls extremely especially as an epoxy resin.

[0004] However, the thickness of the charge of an IC package occupied in a package is becoming thin much more with thin-shape-izing of a package in recent years, for example, when it is TSOP of 1mm thickness, the thickness of the charge of a sealing agent formed in the upper surface of a chip is set to about 0.2-0.3mm. For this reason, if a pinhole and a void (cavity) exist in the charge of an IC package, humidity-tolerant reliability and electric insulation will fall remarkably. About a pinhole void, the moisture contained in involvement of the air at the time of tablet modification or fabrication by the turbulent flow of flow resin or a tablet has been considered as a cause from before. (For example, JP,61-138620,A, JP,63-237910,A, JP,64-61028,A, JP,1-129424,A each number gazette, etc.) .

[0005] However, by the conventional techniques, such as involvement prevention of an air, and prevention of tablet moisture absorption, although it was in being effective in the ability reducing a pinhole void to be sure, it did not become that there is nothing. Moreover, it is already ending with a proposal about the method of volatile matter content other than moisture also being mentioned as a cause of a void (for example, JP,S61-261316,A), and reducing the volatilization ingredient of an epoxy resin constituent for this reason (for example, Japanese-Patent-Application-No. 6-34308 each [Japanese Patent Application No. 5-266192 and] number gazette). It became the void reduction effect in the resin constituent proposed by these is remarkably high, and possible to make a void there be nothing depending on the kind of resin ****. However, in order to raise solder heat resistance further It became clear that further a thin package in particular was not enough about the pinhole void of 0.2mm or less which poses a problem only by reducing volatile matter content if it is in the resin constituent which increased the content of fusion silica using resin of hypoviscosity, especially a crystalline epoxy resin, and it was improved.

[0006]

[Problem(s) to be Solved by the Invention] This invention is what was made in view of the above

situations as a result of continuing examination further about the mechanism of void generating. Involvement of the air generated at the process which carries out heating kneading of the epoxy resin constituent, It aims at offering the manufacture method of the epoxy resin constituent for semiconductor closure of having reduced the void rate of incidence extremely by removing efficiently the air bubbles produced in the fusion process of the crystalline resin which happens at the time of kneading and fabrication out of a resin constituent, and having excelled in solder heat resistance.

[0007]

[Means for Solving the Problem] The epoxy resin to which, as for this invention, (A) melting point contains the crystalline epoxy which is 50-130 degrees C, and has two or more epoxy groups in one molecule 70weight % or more in the total epoxy resin, The fusion viscosity in 150 degree C (B) The phenol resin hardening agent of 5 or less POIZU, (C) A hardening accelerator, the fusion silica powder contained 76 to 94weight % in the (D) total resin constituent, (E) Face [carrying out heating kneading] the epoxy resin constituent which uses the Silang coupling agent as an essential ingredient. The inside of the system of this said direction biaxial kneading extrusion machine is maintained under the decompression condition of 250 or less mmHg, using the said direction biaxial kneading extrusion machine as kneading equipment. Furthermore, it is the manufacture method of the semiconductor epoxy resin constituent characterized by for the temperature of the epoxy resin constituent breathed out from this said direction biaxial kneading extrusion machine after kneading being the temperature more than the melting point of the crystalline epoxy resin of the (A) ingredient in an epoxy resin constituent, and being 90-140 degrees C.

[0008] This invention is explained in detail below. The melting point is 50-130 degrees C, and the epoxy resin used for this invention is an epoxy resin which contains the crystalline epoxy resin which has two or more epoxy groups in 1 molecule 70weight % or more in the total epoxy resin. Although a crystalline epoxy resin is a solid below in the melting point, since it is fused at the temperature more than the melting point and serves as a liquefied thing of hypoviscosity extremely, Even if it increases content of the fusion silica in an epoxy resin constituent, the fusion viscosity at the time of fabrication is low, and it excels in mobility, and gold streak modification of an element and modification of a lead frame can be prevented. However, in order to manufacture an epoxy resin constituent as the melting point is less than 50 degrees C, when mixing with others and an ingredient, melting starts by rises in heat, such as frictional heat, and since workability worsens, it is inferior to productivity. If the melting point exceeds 130 degrees C, when, carrying out heating kneading of the epoxy resin constituent on the other hand, in order to fuse an epoxy resin, high temperature will be needed, therefore a reaction will advance during kneading, and the mobility at the time of fabrication will fall. the usual measuring method with which the melting point judges dissolution of resin in capillary glass externally -- or it can ask easily by measurement of ***** at the time of the crystal dissolution by DSC etc.

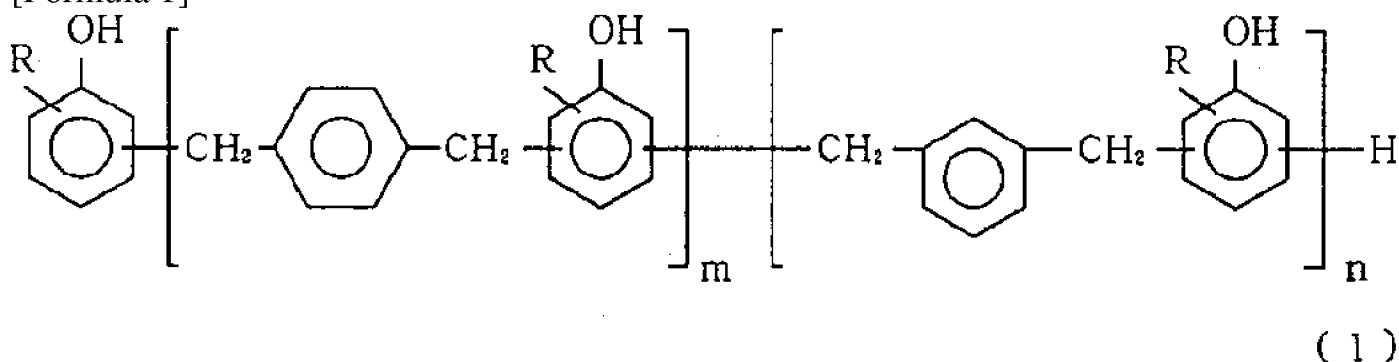
[0009] As an example of this crystalline epoxy resin, 3, 3, 5, 5'-tetramethyl biphenol diglycidyl ether, Although - tetramethyl screw phenol F diglycidyl ether, hydroquinone diglycidyl ether, and 3, 3, 5, and 5 '4, 4'-dihydroxydiphenyl ether diglycidyl ether etc. is mentioned, it is not limited to these. 70weight % or more of the total amount of epoxy resins of the amount of this crystalline epoxy resin used is desirable. Less than 70 weight % will not be enough as the reduction effect of the fusion viscosity of an epoxy resin, and the mobility at the time of fabrication will fall. The monomer in which this crystalline epoxy and the epoxy resin which can be used together have an epoxy group, Point out polymer oligomer and at large and For example, a bisphenol A type epoxy resin, Although an ORUSOKUREZORUNOBO

ack type epoxy resin, a NAFUTAREN type epoxy resin, a bird phenol methane type epoxy resin, a NAFUTAREN type epoxy resin, the epoxy resin of JISHIKUROPENTAJIEN denaturation phenol, etc. are mentioned, it is not limited to these. Moreover, even when these epoxy resins are independent, even if it uses them together, they do not interfere.

[0010] The phenol resin hardening agent which is the (B) ingredient of this invention is characterized by the fusion viscosity in 150 degrees C being 5 or less POIZU. If fusion viscosity exceeds 5 POIZU at 150 degrees C, since the fusion viscosity of the epoxy resin constituent obtained rises, the mobility at the time of fabrication will fall, and being un-filled up of the cast in a metallic mold, and gold streak modification and lead frame modification (what is called a pad shift) will occur. As a measuring method of the fusion viscosity in 150 degrees C of phenol resin, an ICI viscosity meter is simple and common. (B) as a phenol resin hardening agent of an ingredient Point out the polymer [at large] a monomer, oligomer, and at large which have the phenolic hydroxyl group which can perform an epoxy resin and a hardening reaction and can form bridge construction structure, and specifically Although phenol NOBORAKKU resin, KISHIRIREN denaturation phenol resin, TERUPEN denaturation phenol resin, JISHIKUROPENTAJIEN denaturation phenol resin, bisphenol A, bird phenol methane, etc. are illustrated, it is not limited to these. It does not interfere, even if it uses together, even when these phenol resin hardening agents are also independent. As a phenol resin hardening agent which is effective from especially a point of solder heat resistance It is phenol resin which denatured with p- or m-KISHIRIREN structure shown especially by a formula (1), and is usually compounded by the heavy condensation reaction with phenol, p-KISHIRIREN glycol dimethyl ether, or m-KISHIRIREN glycol dimethyl ether. Compared with usual phenol NOBORAKKU resin, phenol resin of this structure has the features, such as reduction in an elastic modulus at the time of heat, high adhesion nature with a base material, and low water absorption, and is effective for reduction of the heat stress at the time of solder immersion, and prevention of package crack generating.

[0011]

[Formula 1]



(R expresses hydrogen and an alkyl group)

[0012] The ratio in particular of p-KISHIRIREN structure of the phenol resin hardening agent of a formula (1) and m-KISHIRIREN structure is not what is limited. Even if p-KISHIRIREN structure and m-KISHIRIREN structure are each independent resin, or whether it is combined use of respectively independent resin or p-KISHIRIREN structure and m-KISHIRIREN structure live together in 1 molecule, it does not interfere at all. In order for the fusion viscosity in 150 degrees C to consider it as 5 or less POIZU, the value of m+n is from 1 to 10, and they are these mixtures.

[0013] (C) As a hardening accelerator of an ingredient, it is a thing used as the catalyst of the

crosslinking reaction of said epoxy resin and a phenol resin hardening agent. IMIDAZORU compounds, such as organic HOSUFIN compounds, such as 1, a friend gin system compound of 8-diazabicyclo (5, 4, 0) undecene 7 grade, and bird phenyl HOSUFIN, and 2-MECHIRUIMIDAZORU, etc. can specifically be illustrated. Whether it is independent or these hardening accelerators are combined use, they do not interfere. (D) Although a granular type and spherical either of the fusion silica powder of an ingredient are usable, it is more desirable to mainly use spherical silica, in order to raise filler content and to suppress the rise of the viscosity of an epoxy resin constituent. Furthermore, in order to raise the loadings of spherical silica, it is desirable to adjust so that particle size distribution of spherical silica may be made large more. As for the loadings of fusion silica powder, it is desirable to contain 76 to 94weight % in the total epoxy resin constituent from the balance of fabrication nature and solder heat resistance. Solder heat resistance is inadequate in the loadings of fusion silica being less than 76%, and if 94 weight % is exceeded on the other hand, even if it uses resin with low fusion viscosity, the mobility at the time of fabrication will fall.

[0014] (E) although gamma-glycidoxypolytrimethoxysilane, gamma-aminopropyl trimethoxysilane, gamma-MERUKAPUTO propyltrimethoxysilane, vinyltriethoxysilane, etc. are specifically mentioned as a Silang coupling agent of an ingredient it is not what is limited to this -- moreover -- these -- even when it is independent, combined use does not interfere, either. Moreover, after processing the Silang coupling agent of the (E) ingredient uniformly to the fusion silica powder of the (D) ingredient beforehand, it may heat-treat, or even if it adds the (D) ingredient for the (A) ingredient or the (C) ingredient and it is mixed for it, it does not interfere. The epoxy resin constituent for semiconductor closure if needed besides the ingredient from (A) to (E) Moreover, a bromination epoxy resin, Low stress additive agents, such as release agents, such as fire retardant, such as 3 antimony oxide, colorant represented by carbon black, natural wax, and synthetic wax, and silicone oil, are blended suitably, and even if these are blended also in the manufacture method of the epoxy resin constituent of this invention, it does not interfere at all.

[0015] This invention is concerned with the manufacture method of the above-mentioned epoxy resin constituent for semiconductor closure. As a result of considering correlation with the pinhole void and the manufacture method of an epoxy resin constituent of generating when fabricating the above-mentioned constituent in detail, the knowledge shown below was acquired. In order to carry out heating kneading of the epoxy resin constituent containing a resinous principle with low viscosity at the time of fusion, and a lot of fusion silica, it is most suitable to use the said direction biaxial kneading extrusion machine as the kneading method. Although a roll is mentioned as the other kneading methods, for example, even melting to a roll which it twists, and a sex falls extremely and is a resinous principle is impossible as the content of the fusion silica of an epoxy resin constituent increases. Moreover, in the case of 1 axis extrusion kneading machine or the different direction biaxial extrusion kneading machine, many condensation things of fusion silica are accepted into the material breathed out since sufficient fusion zone was not obtained. In the said direction biaxial kneading extrusion machine, the kneading thing far stabilized compared with the above-mentioned kneading method is obtained, and the manufacture method in connection with this is also already proposed (JP,H6-226736,A). However, it became clear that effect sufficient by having just merely used the said direction biaxial extrusion kneading machine was not acquired with the epoxy resin constituent in this invention, i.e., the constituent which combined a crystalline epoxy resin and the fusion silica of high content. That is, it is required to set up and manage conditions on the occasion of heating kneading by this direction biaxial

kneading machine of the resin constituent containing crystalline epoxy, so that it may become the range whose resin constituent temperature is more than the melting point of a crystalline epoxy resin and 90-140 degrees C.

[0016] As this Reason, once it fuses a crystalline epoxy resin, the liquefied state of hypoviscosity is shown extremely, but it is because the temperature below the melting point shows a stable solid state on the other hand. It is this point and differs from the resin which has large molecular weight distribution, for example like the conventional ORUSOKUREZORUNOBO rack type epoxy resin. In the conventional amorphous epoxy resin, in order to begin melting from the degree of low temperature sequentially from a low molecular weight constituent, the amount ingredient of polymers is also fused according to the solvent effect of the low molecular weight constituent fused once. On the other hand, the crystalline epoxy resin is almost constant, and the molecular weight fuses it only after it becomes a certain temperature (melting point). Therefore, when carrying out heating kneading of the epoxy resin constituent using this crystalline epoxy resin, an epoxy resin will be mixed with an ingredient besides with a solid state if an epoxy resin constituent is not heated more than the melting point of a crystalline epoxy resin. The crystal ingredient which fused in the micro state and remained is distributing the resin constituent kneaded on such conditions, and when the ingredient fuses at the time of fabrication, in order to cause a rapid volume change, a micro void occurs. Moreover, since this ingredient flows as a hypoviscosity ingredient independently, Bali occurs.

[0017] however, [in the case of kneading of the constituent with which the melting point contains the crystalline epoxy resin below 90 degrees C] Although resin constituent temperature fuses a crystalline epoxy resin at less than 90 degrees C, sufficient kneading effect is not acquired in respect of the effect of the influence of the apparent initial softening of phenol resin which is a hardening agent, and kneading equalization with fusion silica. Moreover, if the temperature of the resin constituent at the time of kneading exceeds 140 degrees C, it will go on, while the reaction of an epoxy resin and a hardening agent resinous principle kneads, and the mobility at the time of fabrication will fall remarkably. In order to realize this kneading condition, it is usually the form (two articles) of a biaxial screw. Or although many things can be set up in the combination of the speed of supply per time of the screw of three articles, etc. composition (the element which makes sending or kneading effective should put together), screw rotation speed, and an epoxy resin constituent, and the temperature of the jacket of a kneading portion The most important point is managing a kneading state at the temperature of the kneaded resin constituent. About the temperature of the kneading thing, it is kneaded and it is most suitable to carry out direct measurement of the temperature of the epoxy resin constituent breathed out from the said direction biaxial extrusion kneading machine. When examination was further continued about kneading conditions, two very big effects were acquired by maintaining the inside of the system of the said direction biaxial extrusion kneading machine at decompression. It is that the temperature of the epoxy resin constituent kneaded by making the inside of a system decompression rises by 20-50 degrees C also under the same kneading conditions as a surprising thing the first as compared with kneading by normal pressure. Although this Reason is a guess Since the air contained in a kneading thing is removed by decompression one, even if the thermal conductivity of a resin constituent improves and the same thermal energy is given, it thinks because the temperature of a resin constituent rising efficiently, and moisture and the organic volatilization ingredient contained in a resin constituent the second are removed by decompression.

[0018] In heating in the temperature range which needs a resin constituent, the greatest advantage of this

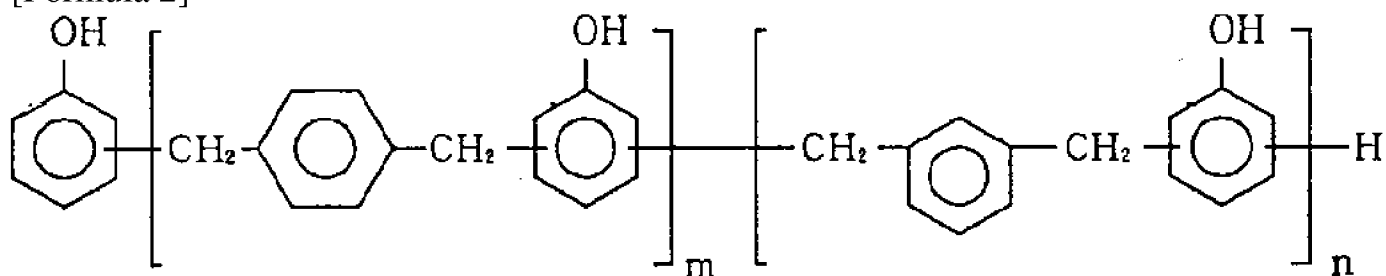
phenomenon is that it is not necessarily required to heat a jacket and to apply heat from the exterior. In heating from a jacket, in order that only the circumference portion of the kneading inside of a plane may tend to receive thermal energy, temperature becomes uneven, and since the kneading effect of a perimeter portion far from a screw is low, the kneading thing of a barrel perimeter part tends to receive thermal energy compared with an inside. For this reason, the particles to which the reaction advanced and which were gelled further will be contained in some kneading things, and it becomes a poor cause at the time of fabrication. On the other hand, by kneading under decompression conditions, cooling or heating at low temperature is enough as a jacket, the heat history of a resin constituent is stabilized far, and a kneading thing with the uniform characteristic can be obtained.

[0019] The second effect of kneading under decompression is the big reduction effect of the void generated at the time of fabrication of a resin constituent. Since moisture in a resin constituent and an organic volatilization ingredient can remove one efficiently according to decompression conditions as this Reason, it is because the volatilization ingredient which causes a void at the time of fabrication does not occur. The second Reason is that it can perform removal of the air bubbles which could prevent involvement of the air produced when kneading a lot of fusion silica and the resinous principle of low fusion viscosity, or were involved in. When a crystalline epoxy resin fuses the air of involvement, it it not only produces it by churning physically, but is considered that the air bubbles produced by volume change when becoming a liquefied thing rapidly are also contained. Although this has more rates of incidence of a void under the conditions which do not decompress at the time of fabrication than the constituent by the epoxy resin whose direction of the resin constituent which used the crystalline epoxy resin is not crystallinity, under decompression, the constituent by which resin is also presumed also from a void not occurring at the time of fabrication, either. Furthermore, to much air bubbles and micro voids being accepted in an inside, when it kneads without decompressing, when microscope observation of the inside of the resin constituent after kneading is carried out, when it kneads under decompression, it turns out that it is in air bubbles and the state in which a micro void is very precise. 100 or less mmHg is preferably required for the degree of decompression in the case of kneading at least 250 or less mmHg. In the degree of decompression exceeding 250mmHg, since the reduction effect of the void at the time of fabrication also has enough the low rise in heat at the time of kneading of a resin constituent, only the inadequate effect is acquired.

[0020] A work example explains this invention concretely hereafter.

Work example 1 3, 3', 5, 5'-tetramethyl biphenol diglycidyl ether (103 degrees C of melting point, amount 195 of these [epoxy group]) 4.2 weight part The phenol resin hardening agent shown by a formula (2) (150-degree C fusion viscosity 3.3 POIZU, hydroxyl equivalent 175) 4.3 weight parts [0021]

[Formula 2]



(Being the inside of a formula, and a bulk density $m/n=3/1$)

[0022]

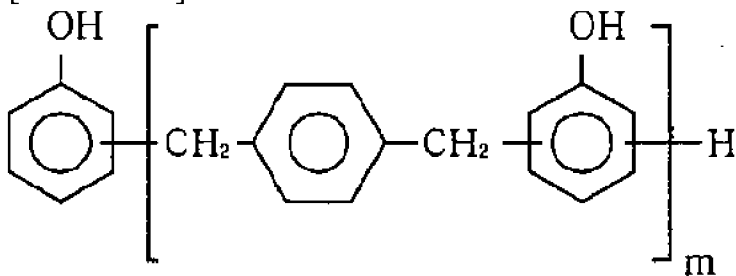
Bird phenyl HOSUFIN 0.2 weight part The fusion silica powder 86 Weight part Gamma-glycidoxypopyltrimetoxysilane 0.5 weight part 3 antimony oxide 1 Weight part Bromination bisphenol A type epoxy resin 1 Weight part Carnuba wax 0.5 weight part Carbon black After mixing each ingredient of the 0.3 weight part above by a mixer, heating kneading was performed using the said direction biaxial extrusion kneading machine. This kneading machine is $L/D=20$, a kneading screw is a three-article screw, and heating kneading was performed on the conditions which screw rotation speed cooled the ratio of kneading/sending of an element by 2.5/7.5, cooled it by 300rpm, and cooled the jacket with water, and made the inside of a system decompression with the vacuum pump at 80mmHg. When the temperature of the resin constituent which was kneaded and was pushed out from the discharge mouth was measured with the thermometer, it was 110 degrees C. The kneaded resin constituent was made into the shape of a sheet of 2mm thickness with a sheeting roll, and it ground after cooling further and was considered as the charge of a sealing agent. The characteristic is shown in Table 2.

[0023] It kneaded on the kneading conditions shown in Table 2 using the epoxy resin constituent of work examples 2-4 and one to comparative example 5 work example 1, and the charge of a sealing agent was obtained. The characteristic is shown in Table 2.

It kneaded on the kneading conditions shown in Table 3 using the epoxy resin constituent shown in six to work-example 5 and comparative example 9 table 1, and the charge of a sealing agent was obtained. The characteristic is shown in Table 3. The structure of phenol resin of a formula (3) and a formula (4) is shown below.

[0024]

[Formula 3]



[0025] The following evaluations were carried out at the charge of a sealing agent obtained by the above-mentioned work example and the comparative example.

Spiral flow: It measured using the metallic mold for spiral flow measurement according to EMMI-1-66 in tool temperature [of 175 degrees C], 70kg/cm² of injection pressure power, and cure time 2 minutes.

Bali : the length of Bali generated in the cast package used for void evaluation was measured.

Void : 80pQFP package (14x20mm, 1.5mm in thickness, and the chip size of package size are 9x9mm) was fabricated by the tool temperature of 175 degrees C, and the pressure of 75kg/cm² for 2 minutes using each molding composition, and post-hardening of 8 hours was performed at 175 more degrees C. This cast package was observed using ultrasonic test equipment, and the number of the voids of the inside more than 0.1mmphi was expressed with (the number/package).

Solder heat resistance : 85 degrees C, the cast package used for void evaluation was neglected under the environment of RH 85% for 168 hours, and was immersed in the 260-degree C solder tub for 10 seconds

after that. The package was observed under the microscope and the number of external cracks was expressed with the number of solder cracks (the number of crack generating packages / the total number of packages).

[0026]

[Table 1]

表 1

	実施例	比較例			
	5	6	7	8	9
* 2	4. 5	1 0. 4	6. 4		
オルソクレゾールノボラック型エポキシ樹脂* 3				8. 0	8. 0
式(3)のフェノール樹脂* 4	4. 0	1 0. 1			
式(4)のフェノール樹脂* 5			6. 1		
フェノールノボラック樹脂* 6				4. 5	4. 5
トリフェニルホスフィン	0. 2	0. 3	0. 2	0. 2	0. 2
溶融シリカ粉末	8 6	7 4	8 2	8 2	8 2
γ-グリシドキシプロピルトリメトキシシラン	0. 5				
三酸化アンチモン	1				
臭素化ビスフェノールA型エポキシ樹脂	1				
カルナバワックス	0. 5				
カーボンブラック	0. 3				

* 2: 3, 3', 5, 5'-テトラメチルビスフェノールFジグリシジルエーテル、融点80℃、

エポキシ基当量202、* 3: 軟化点65℃、エポキシ基当量200、

* 4: 150℃での溶融粘度2. 9ポイズ、水酸基当量172、

* 5: 150℃での溶融粘度7. 1ポイズ、水酸基当量178、

* 6: 150℃での溶融粘度1. 7ポイズ、水酸基当量104

[0027]

[Table 2]

表 2

	実施例				比較例				
	1	2	3	4	1	2	3	4	5
同方向 2 軸押し出し									
エレメント練り／送り比	2.5/7.5	3.5/6.5	2.5/7.5	2.0/8.0	2.5/7.5	2.5/7.5	3.5/6.5	2.0/8.0	
スクリュウ回転数 (rpm)	300	300	100	200	200	300	300	100	
ジャケット温度 (°C)	水冷	水冷	水冷	60	120	120	水冷	水冷	
減圧度 (mmHg)	80	30	80	80	80	常圧	350	200	
ロール混練									
高温／低温 ロール温度 (°C)									95/60
吐出物温度 (°C)	115	125	110	120	150	115	105	70	*1
スパイラルフロー (cm)	91	87	95	85	50	76	96	80	
バリ (mm)	0.3	0.1	0.2	0.1	0.1	0.2	0.3	2.7	
ボイド (個数／パッケージ)	0	0	0	0	0	24	13	29	
半田クラック数	0/10	0/10	0/10	0/10	3/10	0/10	0/10	8/10	

*1：混練不可

[0028]

[Table 3]

表 3

	実施例	比較例			
	5	6	7	8	9
同方向 2 軸押し出し					
エレメント練り／送り比	2.5/7.5	2.5/7.5	2.5/7.5	2.5/7.5	
スクリュウ回転数 (rpm)	300	300	300	300	
ジャケット温度 (°C)	水冷	水冷	水冷	水冷	
減圧度 (mmHg)	80	80	80	80	
ロール混練					
高温／低温 ロール温度 (°C)					90/30
吐出物温度 (°C)	110	95	130	125	
スパイラルフロー (cm)	97	133	38	63	59
バリ (mm)	0.2	0.4	0.1	0.2	0.2
ボイド (個数／パッケージ)	0	0	0	0	4
半田クラック数	0/10	8/10	4/10	10/10	10/10

[0029]

[Effect of the Invention] Involvement of the air generated at a heating kneading process by the manufacture method of this invention, The epoxy resin constituent for semiconductor closure which removes efficiently the air bubbles produced in the fusion process of the crystalline resin which happens at the time of kneading and fabrication out of a resin constituent and which could carry out things, and was made to reduce a void rate of incidence extremely, and was excellent in solder heat resistance can be obtained.

[Translation done.]